Reliable Supply and the Global Nuclear Energy Partnership (GNEP)

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Introduction/Background

As part of President Bush's Advanced Energy Initiative, the Bush Administration has announced a new Global Nuclear Energy Partnership (GNEP) that seeks to increase U.S. and global energy security and promote nonproliferation through the expanded use of proliferation-resistant nuclear energy to meet growing electricity demand. The key elements of GNEP include the expansion of domestic use of nuclear power; demonstration of proliferation-resistant recycling; the minimization of nuclear waste; the development of advanced burner reactors; the establishment of reliable global fuel services; the demonstration of small- and medium-scale, proliferation-resistant reactors; and the revitalization of programs for advanced nuclear safeguards.

The closed fuel cycle model envisioned by this partnership requires development and deployment of technologies that enable recycling and consumption of long-lived radionuclides in radioactive waste. More specifically, GNEP would achieve its goals by:

- having nations with secure, advanced nuclear capabilities provide fuel services — assured supply of fresh fuel and the disposition of spent fuel — to other nations who agree to forgo enrichment and reprocessing activities;

[1] The views expressed are the author's own and not those of the Los Alamos National Laboratory, the National Nuclear Security Administration or the Department of Energy.

- demonstrating the critical technologies needed to change the way spent nuclear fuel is managed; and
- building recycling technologies that enhance energy security in a safe and environmentally responsible manner, while promoting nonproliferation.

This paper will assess the importance of assured supply to GNEP in the context of its nonproliferation vision.

The GNEP Nonproliferation Vision

It might be argued that because recycling technology and advanced burner reactors will be limited to either nuclear-weapon states (NWSs) or to other states with advanced fuel cycles, that nonproliferation and safeguards are irrelevant and that those GNEP elements that referred to nonproliferation were unnecessary. This would be erroneous, as it does not take into consideration such factors as domestic and international public acceptance, the importance of transparency for the states with these facilities, the long-term risks posed by states that might not accept GNEP and by nonstarter actors, etc.

Nonproliferation is important to GNEP. The partnership offers a bold, comprehensive vision of the future of nuclear energy that seeks to address the challenges posed by a number of the most pressing of today's proliferation problems. It attempts to address the spread of sensitive nuclear technology and the concerns posed by vast stockpiles of separated plutonium, as well as to meet the nonproliferation demands of a global nuclear energy renaissance.

If GNEP succeeds as planned, significant nonproliferation benefits could be expected, including:

- Slowing, if not halting, the spread of enrichment and reprocessing (ENR) technologies;
- Creating a fully functioning, effective and nondiscriminatory assured fuel supply/take-back regime that should facilitate the political acceptance of ENR limitations;
- Limiting inventories of separated weapon-usable material and ensuring that they are rigorously safeguarded, protected and accounted for;
- Slowing, if not halting, further production of separated plutonium, as new recycling technologies will allow the burning of plutonium in fast spectrum reactors without ever having separated it from other actinides; and
- Minimizing and disposing of waste, reducing potentially attractive targets for terrorists.

In this world, even if there were near-universal buy in for GNEP by states, there would continue to be proliferation problems and risks. There would be growing requirements as a result of take back to move spent fuel around the world, increasing transportation risks to some degree. At least some states could be expected to develop or expand virtual capabilities through their fuel-cycle choices, creating the prospect of a breakout. Finally, states with clandestine programs will remain a possible threat, as will non-state actors seeking nuclear and radiological weapons. These issues they must be seen in perspective. They will appear and need to be addressed to some degree with or without GNEP, but they cannot be ignored and must be considered in the GNEP calculus.

Beyond any such risks, it must be recognized that GNEP technology, and the nonproliferation approaches surrounding it, including advanced safeguards and proliferation resistance, will need to be fully demonstrated.

Reliable Supply and GNEP

Given the importance of nonproliferation to GNEP, a key lynchpin for realizing the GNEP is development of a next-generation nonproliferation system, including advanced safeguards and proliferation resistance. Perhaps even more important is the need for binding assurances of fresh fuel supply and spent fuel take-back provide a means for states to implement nuclear energy programs under GNEP without being driven to develop or otherwise acquire enrichment and reprocessing (ENR) capabilities. A framework of such assurances would meet GNEP's objectives of significant increases in nuclear power while minimizing the risks of proliferation. As this element of GNEP is pursued, however, it must be recognized that there are some states for which no positive inducement could get them to forego ENR.

Even with questions of holdouts aside, assured supply proposals have floundered in the past. However, there are key differences in the situation today from that of the earlier considerations of assured supply, including: a more widespread sense of regional and international insecurity, including the prospect of nuclear terrorism and long-term energy shortage; the rise of new, illegitimate sources of nuclear weapons supplies, including black markets; and evidence of NPT noncompliance and the use of Article IV as a

loophole to potential development of a nuclear-weapon program. Thus, the context for pursuing and implementing an assured fuel supply arrangement has changed.

Ensuring Reliable Supply

Assured supply can be an effective nonproliferation measure, but it will not have universal appeal. States committed to nuclear weapon development or those who wish to master the entire fuel cycle are not likely to accept assured supply under any circumstances. However, the vast majority of states should, in principle, be willing to consider an attractive assured supply offer.

For assured supply arrangement to have tangible nonproliferation benefits, a state electing to enter into an assurance of supply arrangement must agree not to exercise its right to pursue enrichment and reprocessing in the context of peaceful nuclear applications in exchange for specific guaranteed benefits. The state's commitment must be verified, and there is a need to ensure this can effectively be done through safeguards and perhaps additional measures that would be agreed by states. Under these conditions, if one expects states to enter into assurance of supply arrangements, and accept a verifiable commitment to forego sensitive nuclear activities, there must be clear political, economic and other benefits. States will look for guarantees, building on those afforded by the market, but will likely demand backup political measures in case of a disruption of the market or an effort to cut off supply for extraneous reasons.

Assuring Fresh Fuel Supply

Given the state of fuel services today, which has many suppliers, some degree of assured supply in the marketplace already exists. This may reduce its attractiveness of assured supply schemes as an incentive. A fresh fuel stockpile is probably not needed today. However, the future growth of nuclear energy could affect the market-based assurance, as could any moves toward greater efforts to constrain supply for political reasons. For this and other reasons, a stockpile may be desirable in the longer term.

In this context, the impacts of assured supply on the market are unclear, but will have to be managed. Market-based approaches to assurances of supply could involve the purchase or lease of fuel. They could be purely commercial or more political in nature. They may be developed through the Nuclear Suppliers Group (NSG), supplier consortia, the IAEA or through other means.

A fuel bank might be established under the auspices of the IAEA, or another entity, in which the United States and other suppliers might contribute uranium, including excess highly enriched uranium (HEU) from weapons. The proposal of US Secretary of Energy Samuel Bodman at the 2005 IAEA General Conference might be a step in this direction, although the material would continue to fly the US flag. Such issues as how the possession of a bank would be maintained and the conditions for producing reactor fuel, including any blending and conversion operations, would need to be resolved. An IAEA panel could be convened to develop an international model for this assurance of supply mechanism. Importing states would presumably apply for a designated assurance under which the established inventory would be allocated. Whether the fuel bank might operate on prospective future deposits would be a separate consideration.

Multinational ownership needs to be addressed. In the February 2005 IAEA Experts Group Report on Multilateral Approaches to the Nuclear Fuel Cycle, emphasis was placed on finding alternative ways to manage the nuclear fuel cycle from front to back. The report foresees a future need for a strong international body to maintain an assured nuclear fuel supply.

This is an old idea that has been endorsed in various proposals and reports over the last 50 years. It requires continued analysis. Its viability depends ultimately on common interests (commercial, political, industrial, etc.). It cannot be imposed from the top down. It should not interfere with market mechanisms; cartel approaches would be counterproductive.

Take-Back

If assured fuel supply has front- and back-end features, the carrot value of dealing with disposing of spent fuel might be more attractive than ensuring continued fresh fuel supply. However, assurances for spent fuel management will require difficult political choices to be made.

Take-back options are designed to provide incentives beyond those associated with the provision of fresh fuel by offering a means to address the urgent issue of spent fuel storage and disposal without proliferating the number of sites or spreading reprocessing capacity to states that do not now possess it. In principle, economic and nonproliferation benefits would ensue. However, such issues as which state or states would take back

spent fuel, the conditions under which they might do so, the ultimate disposition of the fuel and the economics of the enterprise are major problems for take back. These issues are less well characterized than those involving the assured supply of fresh fuel. To date, proposals have been limited.[2]

Conclusions

There is significant interest in reliable supply. Proposals have been put forward not only by the United States but also by others. All parties appear to be backing proposals with the potential to deter or dissuade states from the desire to develop enrichment or reprocessing technologies. Despite differences over approaches, it should be possible to develop a common international framework encompassing a number of options leading to the desired outcome: nuclear power without proliferation. However, there are considerable challenges to realizing an assured supply regime, including its relation to and impact on the market, the measures necessary to convince states it will work as promised, etc. To address these challenges, it is imperative to rapidly develop the details of assured supply options (e.g., scope, modalities, etc.) using the material promised for this purpose by Secretary Bodman as the basis. Market-based options provide a good starting point because it will be imperative that any arrangements do not adversely affect the market. Efforts to ensure that secondary sources (such as HEU down-blending) do not negatively impact the market will also need to be considered. In addition, all of the ideas associated with assured supply should be vetted with industry.

[2] Current initiatives include the IAEA Experts Group Report on Multilateral Approaches to the Nuclear Fuel Cycle (2005) and Russian proposals.

In the context of options, development of nonproliferation criteria for assured supply is critical. This step, as noted, is not simple and could be one of the key roadblocks to the success of an assured supply regime. Principles of assured supply must be enunciated. The quid pro quo for assured supply must be a renunciation of sensitive technologies. There is the related question of who is entitled to what, which is essential if one were to provide supply assurance. Effective means to ensure compliance are critical and must be developed.

Development of spent-fuel take-back options is essential. Studies of critical issues, including where spent fuel may ultimately go, are necessary before detailed options can be develops. In this context, it will be essential to consider changes to US laws to allow take back of spent fuel from other states or allow US-controlled material to go elsewhere. It will also be essential to explore with Russia and other states their interest in spent fuel take back to determine whether any state is willing to agree to take back spent fuel, the costs and benefits of that state doing so, and the legal, regulatory, political and other requirements of the United States to ensure this occurs. In the case of Russia, for example, this would involve at the very least a reconsideration of differences over Iran and the prospect for negotiation/conclusion of an Agreement for Cooperation.